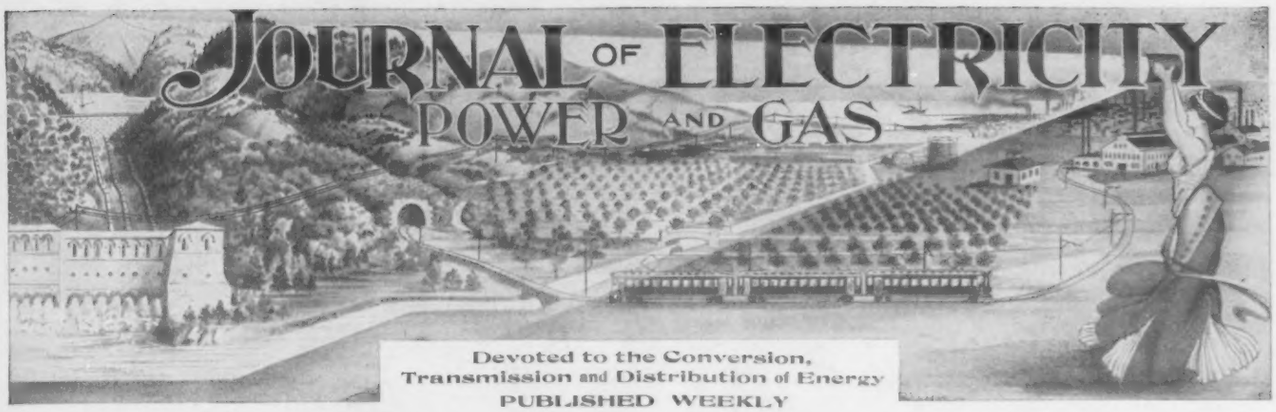

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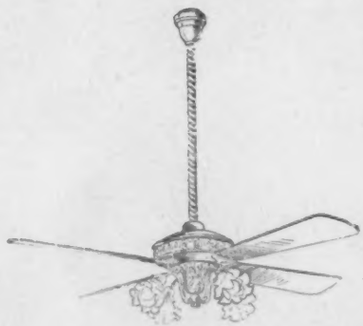

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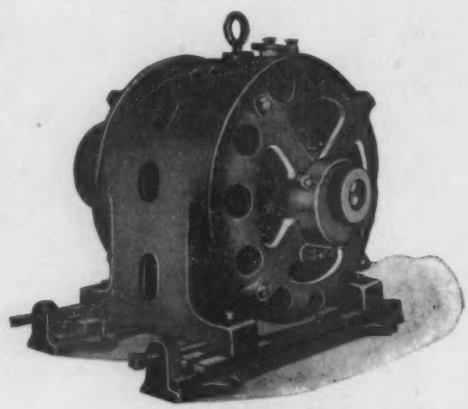

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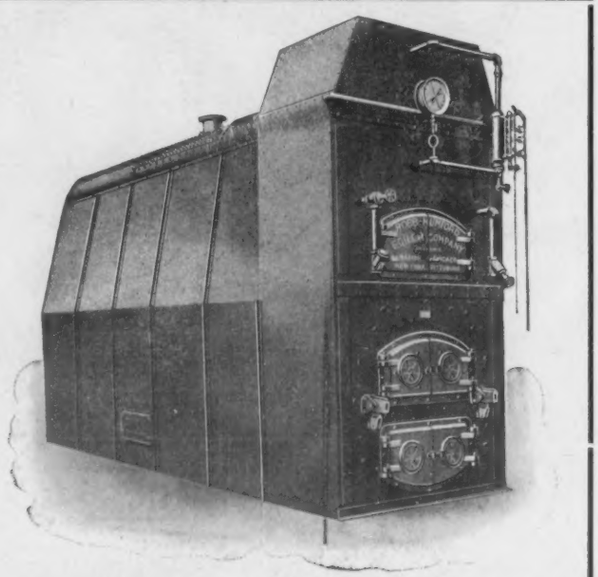

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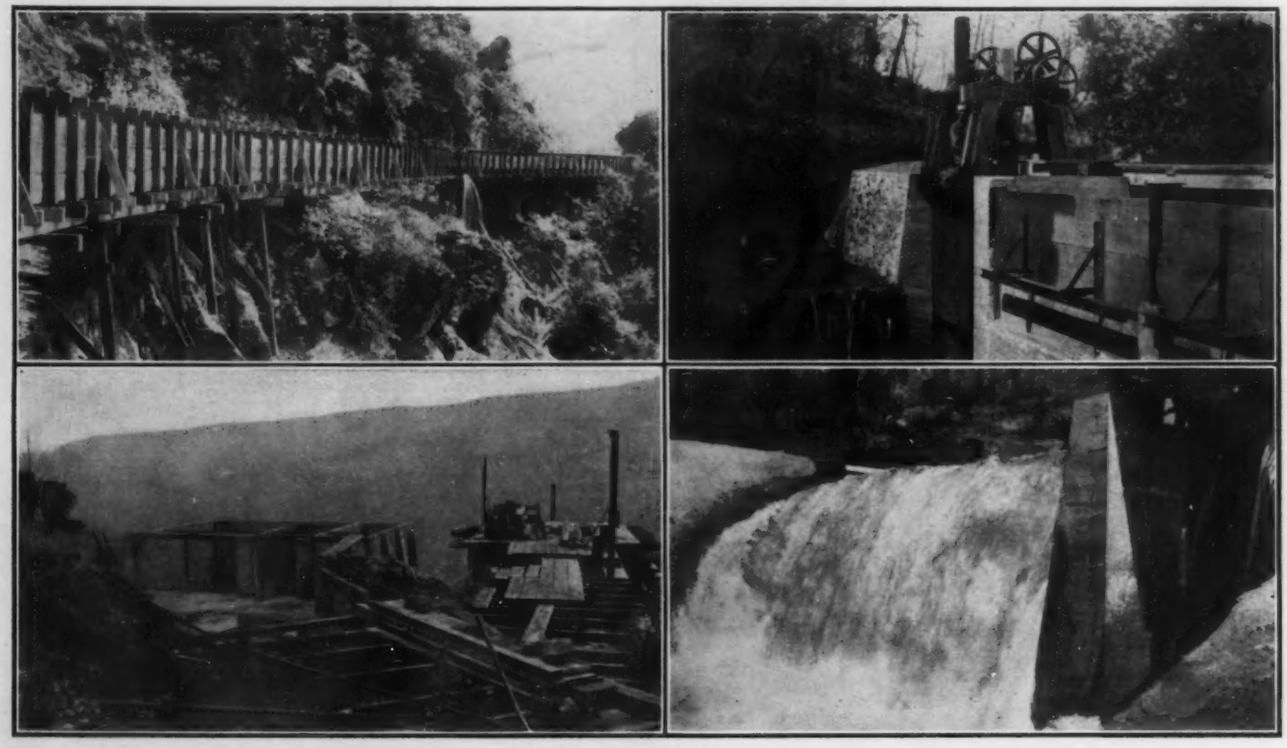
VOLUME XX. SAN FRANCISCO, CAL., MARCH 7, 1908 No. 10

CENTERVILLE CANAL.

As indicated in last week's paper descriptive of the high-head Francis turbine at the Centerville plant of the California Gas and Electric Corporation, great care is necessary to keep out silt, leaves and twigs from the pipe line. These clog the gates and wear the vanes. Consequently the necessity for careful ditch and flume line construction is evident.

Wooden head gates, operated as shown in the accompanying picture, regulate the flow of water into the canal. The gates are supported by a concrete wall, which raises the operating device above extreme high water and serves as a protection to the canal approach during high water and consequent debris. The canal approach at the bottom



CENTERVILLE FLUME.
FOREBAY DURING CONSTRUCTION.

SETTLING BASIN DISCHARGE, SHOWING CONSTRUCTION OF FLUSH BOARDS SPILLWAY.

As stated in that paper, the Centerville plant makes a second use of the water that has already developed 14,000 kilowatts at the De Sabla powerhouse, about eight miles above. About a quarter of a mile below the De Sabla powerhouse, a cyclopean concrete dam, 15 feet high, 3 feet wide on the crest, 90 feet long, and arched up stream, diverts the water from Butte Creek into the canal intake. The reconstructed remains of an old log crib dam above the new dam site were used as a wing dam to allow excavation to the rock bed. After the forms had been built, the concrete was wheeled and dumped into the place, large boulders were placed by hand throughout the mass at least three inches apart and the same distance from the forms. Wherever there was enough space between the rock, spalls were used. The concrete was poured wet, and each large rock was worked into place to secure a good bed. A hard, smooth surface was given the crest of the dam by a rich grout.

has a rapid grade from the head to the side gates, where it is four feet below the canal grade; this allows the sand and gravel to settle before discharge through the side gate. Once a day is usually often enough for this, but during stormy weather it is done twice each day. The four-foot rise from the bottom of the canal grade is vertical and curved from the back wall to the lower side of the gate to prevent turbulance and make the velocity of approach effective for discharging the sand and gravel through the sluice gates.

Ditch work forms 80 per cent of the canal, there being but 1.6 miles of flume in its length of 8.3 miles. It had originally been built to supply 45 second feet to mines below. Contrary to the usual practice, this ditch had been dug on a uniform grade of 1.28 feet per thousand feet. During years of disuse it had been overgrown with brush and broken down in places, but it formed an excellent basis for the new line. In rebuilding, its capacity was increased to 175 second feet,

with an average width of 11½ feet, and an average depth of 5½ feet, with the same grade. The side slopes varied with the character of the material through which the ditch was

CANAL PRIOR TO CONSTRUCTION.

running, being determined in the field. A rock wall was built wherever rock was plentiful and the bank was loose and porous; plank side lining was used only where no other rock was convenient. Clay puddle was placed between the berme and the lining to prevent saturation and sloughing of the outer bank. The photograph shows the original and final section of the ditch.

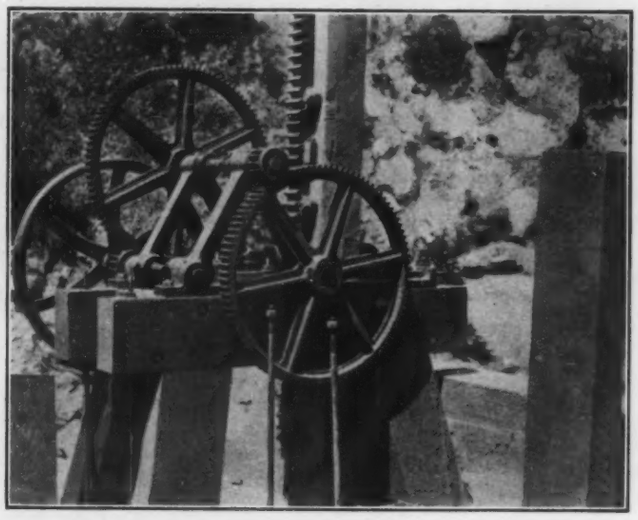
In the flume work, heart sugar pine was used for the battens and box boards; belting, stringers and bent work being of heart spruce. The framing was done at the head of the canal and the lumber floated down and distributed before construction commenced, the ditch and flume work being carried on simultaneously. A 6-inch Fox dado head and 16-inch cut-off saw run by an electric motor did the framing. The dado would cut a gain ¾ inch deep and 6 inches wide quicker, cleaner and better than could be done by hand. After digging to a solid foundation, 6-inch by 8-inch cedar blocks were used as mudsills, upon which were placed the batten posts. The cedar resists decay better than the spruce and is easily renewed. The accompanying photograph shows the type of construction generally employed. Sixteen feet on either end of the flume were constructed on the ditch tangent, thus throwing all of the curve into the flume proper. This prevents the disturbance at the ends of the flumes, which was also guarded against by goring the end boxes and finishing off with four feet of rock wall with a warped surface. These precautions eliminate entrance and exit losses. Deep sand boxes with waste gates were placed at intervals along the canal, which catch silt and turn the water out of the canal in case of trouble from slides or other causes. At the lower end a grizzly was placed in the canal at an angle of 30 degrees, the submerged end being supported one foot above the ditch bottom with a heavy angle. All leaves, limbs and other large, light debris are carried up the 30-degree slope of the grizzly by the velocity of the water. This material is raked off daily by the ditch attendant.

Between the grizzly and the forebay is a large settling basin equipped with deep waste gates and two sets of flash boards ten feet wide and two feet high. The latter trip automatically if the water raises above the normal. In the picture of these flash boards, it will be seen that they are free to turn about a horizontal axis, being normally kept in position by the weight of a rail on the lower side. As the water rises above normal its pressure counteracts this and trips the boards so as to allow the water to flow out above and below it, When the pressure is removed, it swings back into place again. This removes the necessity of constructing a very wide-crested shallow weir, and allows close regulation of head water level. Mr. James H. Wise, assistant hydraulic engineer for the California Gas and Electric Corporation designed and constructed the entire works.

CENTERVILLE HEAD DAM.

The settling basin is forty feet long, fifteen feet wide, and ten feet deep. Its bottom is curved from the back to the lower side of the sluice gate to permit the free discharge

of the silt. This is drawn off from below as a thick sludge until the water runs clear. The grizzly and settling basin, supplemented by the various sand boxes, remove a large



GATE MECHANISM.

amount of material daily, instead of allowing it either to pass into the pipe line or accumulate in large settling basins without frequent discharge.

A regulating reservoir could not be built at the head of the pipe line because of the steep side-hill slopes at the lower end of the canal, consequently a reinforced concrete forebay was built. As shown under construction in the view, it is 25 feet long, 18 feet wide and 20 feet deep, with six-inch walls. The reinforcement consisted of round rods. The three pipe intakes were separated by two vertical walls, which, together with the controlling gates, permit any one of the pipes to be emptied while the others are supplying water.

As already shown in the preceding article, two 400-kilowatt impulse units were removed before the new 5,500-kilowatt turbine unit was installed. In addition to the two 24-inch pipes, a third pipe line, 36 inches and 42 inches in diameter, was put in, the three pipes being connected together at the powerhouse by means of a multiple casting, a "Y" being placed in one of the 24-inch pipes for the 900-kilowatt water-wheel connection. The new line is of riveted steel throughout, 2,566 feet long, of which 675 feet is 36 nches in diameter, and 1,891 feet is 42 inches in diameter. The pipe is made up of cylindrical inside and outside courses and the diameters given are the inside diameters of the inside courses. The longitudinal seams aredouble-riveted lap-joints of about 70 per cent efficiency; the transverse seams are single riveted. A slip joint is provided near the forebay, which allows of expansion and contraction of the pipe line.

The pipe was furnished and laid by Schaw-Batcher & Company, of Sacramento, being made in their shop in three-course sections twenty-three feet in length, shipped to Chico by rail, and hauled to Centerville on wagons. Pneumatic tools were used for all field work, such as reaming, riveting, caulking and holding on. The pipe is supported on concrete piers at intervals and securely anchored with 1½-inch round iron rods. Six-inch air valves were placed at the critical points.

CENTERVILLE HYDRO-ELECTRIC POWER INSTALLATION*

By H. HOMBERGER.

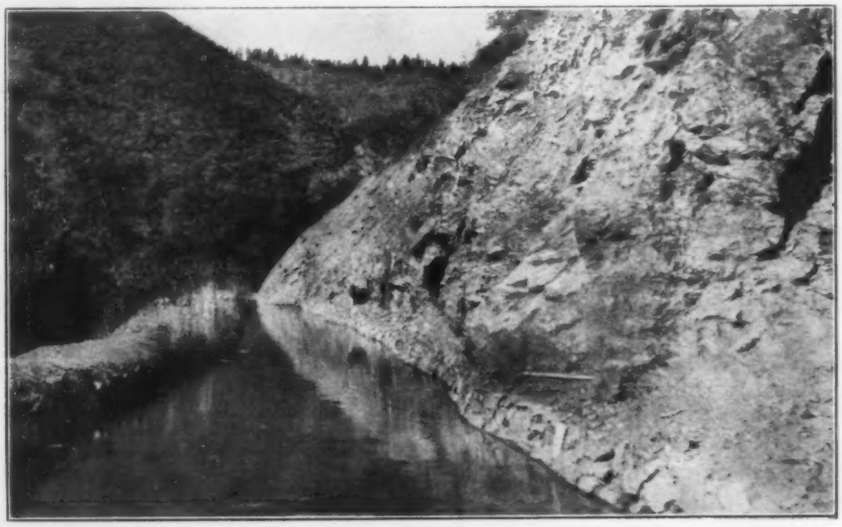
Whether under certain given conditions, viz., head, character of load, length of pipe line, and velocity of flow in the latter, an impulse wheel or a turbine is more advantageous, is at present still an open question. In Europe, low-head plants are installed in preference to high-head developments, because in thickly settled countries it is difficult and costly to acquire high-head water rights, which, to a large extent, holds true in the northeastern part of the United States. Therefore, the low-head water-power machine in Europe has reached a higher state of perfection, and designers and users are more in favor of it because more familiar with that type of hydraulic prime mover.

On the Pacific Coast, where high-head water powers can be obtained easily and cheaply, where the water supply is limited, and where the transportation of great bulk is expensive, high-head installations are preferable; and with the exacting requirements of hydro-electric power generation and transmission, the crude and inefficient hurdy-gurdy of the early miners has, in the form of the modern tangential water-wheel, reached a very high point of perfection.

The most important points, and at the same time the most delicate, with any water-power machine are efficiency and regulation; and in order to pass upon a certain machine as a new departure and eminently successful, these points deserve first consideration. Definite efficiency tests have not been made on the Centerville turbine, but Mr. Wise states that the efficiency will be above 80 per cent, as indicated by preliminary tests. This is nothing extraordinary, as 83 per cent efficiency can be obtained easily with impulse wheels under the conditions as stated. The guaranteed efficiencies were 80 per cent at full load, 82 per cent at three-quarter load, and 77 per cent at half load. If the turbine should run under a heavily fluctuating load, the average efficiency must be decidedly lower, as Mr. Wise stated, with a closing time of five seconds, that it took the relief valve 30 seconds to close. The relief valve having the same vent as the turbine, this must necessarily result in a considerable waste of water.

Fortunately for the turbine, such conditions do not exist in the Centerville plant. The turbine is expected to run under full load all the time, and the regulation is taken care

*Discussion of paper read by Mr. James H. Wise, at the bi-monthly meeting of the San Francisco Assocation of the American Society of Civil Engineers, February 21, 1908.



RECONSTRUCTED CANAL.

of in some other plant by impulse wheels, where a storage reservoir is available, and, incidentally, where the most efficient operators are located.

For this reason, probably, the speaker of the evening has not dwelt on the regulation performance of the turbine; the relief valve apparently was tested as a safety device only, and not as one of the elements of the regulating and governing mechanism. It was evidently satisfactory to see that no trouble occurred when the entire load was dropped suddenly. With a frequently and heavily varying load, and a velocity of some 12 feet per second in the supply pipes, as the conditions actually are at Centerville, no satisfactory regulation could possibly be obtained with this turbine.

Mr. Wise stated that for large units under heads from 200 to 600 feet, a Francis turbine was cheaper than an impulse wheel, a higher turning speed could be obtained, and the application of a draft tube resulted in a better utilization of the available head. I wish to somewhat modify these statements.

The purchase price alone of the bare turbine is no criterion of the ultimate expense to the user. Sales prices are not always governed entirely by the actual manufacturing cost of a machine. In order to give good regulation for varying loads, the pipe line must be considerably larger in diameter for a turbine than for an impulse wheel under equal conditions; and last, but not least, the maintenance expense must not be overlooked. This turbine has been running less than four months, and under extremely favorable load conditions, but the elaborate protections necessary to guard the turbine against wear of the working parts permit a direct conclusion as to how undesirable the replacing of these parts would be. With an impulse wheel, the only wear, even if the water is carrying much detritus, occurs at the nozzle tip, needle, and buckets, and the latter suffer very little, as experience has shown. The replacing of these parts is very simple and quickly accomplished. Should by accident a bucket break, a few hours would suffice to replace it, and it costs but little to carry a few spare buckets in stock. If a vane of a turbine should break out, even if the fragments found their way through the draft-tube into the tailwater without doing damage to the wickets, the turbine runner would be unbalanced, and would have to be replaced. A spare runner is not only very costly, but in order to put it in, the entire machine has to be dismantled, and a shut-down is necessary. The same holds good for the guide vanes and wicket gates, the wearing down of which results in serious loss of efficiency.

The higher turning speed which can be obtained with a Francis turbine, and which cheapens the installation cost, is also to be taken "cum grano salis." There is a dividing line where generators cease to be cheaper as the speed increases, and the curve of production cost goes up again. With reference to the highest permissible speed of an impulse wheel, Mr. Wise apparently is not familiar with the progress that has been made in that respect during the last two or three years. To obtain 10,000 horsepower under 565-foot head, or even under 555-foot head—discarding ten feet of draft head of the Centerville turbine, considering these ten feet the difference between highest and lowest tailwater level—a speed of 400 revolutions per minute could be readily obtained without putting several wheels on the shaft and using two or three nozzles to each wheel. With the most modern design of vertical-shaft, multiple-jet impulse wheel, turning speeds can be obtained which give all that can be desired in low cost of first installation, and the high-pressure step bearings, which seemed to be objectionable, have successfully passed the experimental stage.

Such units of large capacities have been successfully installed in Mexico and Brazil by the manufacturer who is in reality responsible for the Centerville turbine.

Under 550-foot head, such vertical units would not take a bit more room in the powerhouse than a horizontal or vertical Francis turbine. This, however, was of secondary importance at Centerville, as the powerhouse was already provided, and only height had to be added.

Draft tubes are no monopoly of the turbine. They can be used as diffusers for impulse wheels also. It is the question, however, whether it pays to go to the trouble, loss, and expense caused by stuffing boxes, air-tight housings and foundations, to gain one or two per cent in power, which is only actually gained during the period of low tailwater, and which is materially cut down with fractional loads. If it can be shown that an impulse wheel under 555-foot head gives a 3 per cent better efficiency than a turbine with 10 feet additional draft head, then the advantage of the draft-tube claimed for the turbine is offset.

In summing up, I wish to say that to justly compare the two types of machines, two cases must be selected where both work under the same conditions—all details and service conditions must be considered—and I believe I am safe in saying that under a 600-foot head, and even for 10,000 horsepower, the impulse wheel is today the more satisfactory machine, if properly designed and built. To draw the conclusion from this particular turbine, with the easy conditions of load and regulation under which it has been working for four months, that a 10,000-horsepower reaction turbine is more desirable than an impulse wheel under a 600-foot head, I should at least call premature.

CHECKING DRAWINGS.

M. R. Kavanaugh, of Detroit, Mich., calls our attention to the necessity of carefully checking all drawings in order to correct errors and expedite work in the draughting room. During his extensive experience as checker he has observed that many mistakes are caused by carelessness. The best draughtsmen at times lapse so as to make foolish errors. Failure to comprehend the work that the mechanism or tool is desired to perform, and also lack of care in pre-determining the amount of paper space available, result in the loss of many hours' work.

The men who have to be watched the closest are those with technical training and a consequent wide variety of ideas, but lacking practical experience. The best results are obtained by one man checking for such a number of draughtsmen as he can conveniently handle thoroughly. In a short time he will become familiar with each man's work, learning where he is most likely to fall down, when it will be very unlikely for any grave error to pass unnoticed.

To facilitate the work and be sure that the drawings are thoroughly checked I use a regular form of procedure which I give below:

1. Either know or ascertain definitely what the mechanism or tool is desired to do, i. e., what is wanted.

2. Check for interferences, meaning also checking for correct fits and ease of operation. Be sure ample clearance is allowed.

3. See that the drawing is correctly made as regards projections, and that all views necessary and no more are shown. Be sure that all dimensions are on the drawing and that no figures will have to be indirectly obtained by the shop.

4. Check all dimensions by scaling, and when necessary, by calculation. This includes checking over all and center to center distances from known data by calculation.

5. Be sure that all parts are of the proper material and of sufficient strength, and proper finish, and that all parts are called for and dimensioned correctly.

6. Utilize standard parts, and standard screws, bolts, nuts, etc., wherever possible.

7. Check up pattern and symbol numbers. Have drawing conform to the standard system in regard to size, style, and general execution.

ELECTRIFICATION OF RAILWAYS.

By Dr. Gisbert Kapp.

(Continued.)

The impossibility of racing on a down grade is a valuable property of the three-phase system, but the necessity to take up gradients at full speed may be inconvenient because putting too heavy a strain on the plant. There is, of course, no absolute necessity of working the motor always at full speed; we can run it permanently in the starting condition when the slower speed is attained by the insertion of inductionless resistance into the rotor circuit, but such an expedient would be very wasteful, and there would be some difficulty in dissipating the heat generated in these resistances. A method had therefore to be found which would allow three-phase motors to be used at different speeds without wasting energy in resistances. Two such methods have been put into practice. The one consists in using a winding for stator and rotor which allows an alteration in the number of poles. The speed of the motor being inversely proportional to the number of poles, it is obvious that we can run at half speed if we double the number of poles. This may be done by a system of winding in connection with a controller which permits every alternate coil to be reversed. Such an arrangement, designed by Messrs. Brown, Boveri & Co., is used in their latest Simplon locomotives.

Another method of changing speed without wasting power is the use of what is known as "cascade working." This method has been brought to great perfection by Messrs. Ganz & Co., who have used it first on the motor coaches for the Valtellina line five years ago. Each coach runs on two four-wheel trucks, and each of the two axles is direct driven by a motor surrounding it. The rotor is not keyed on the running axle, but on a quill with sufficient clearance to allow for the play of the springs. The motor is suspended from the floor of the coach, and the connection between its rotor and the driving axle is by means of flexible links. Of the two motors on each truck, one is wound for 3,000 volts and the other for 300 volts. The latter is the cascade motor. It receives current from the rotor of the high-pressure motor when starting, or, when running up hill, the motors are coupled, and both are contributing about equal shares of tractive force. The speed is halved. When running on the level the cascade motor is cut out and runs idle, whilst the high-pressure motor is doing all the work at full speed. In this case the starting resistance is by the action of the controller detached from the cascade motor and placed in direct connection with the rotor of the working motor. The transition from half to full speed is thus made gradually. In another arrangement of cascade working the two motors are placed into the same housing and the rotors are permanently connected, so that only one set of slip-rings is required. If the switch is placed to the right, the working is in cascade; if to the left only, the high-pressure motor is giving power.

In both arrangements here described the speed can only be halved, since the cascade motor has the same number of poles as the high-pressure motor. If more than two speeds are required, this can be accomplished by giving the two motors different numbers of poles. Thus, if two motors are used, and one has eight and the other twelve poles, we can get three speeds, which are in the ratio 1/8, 1/12, 1/20. But in this case both would have to be high-pressure motors, since either must be capable of taking the supply direct from the trolley. Since the rotor of the first motor cannot conveniently be wound for high pressure, a step-up transformer would have to be inserted when working cascade, and to avoid this complication Koloman von Kando has devised an ingenious way of winding the stator of the cascade motor so that it may be either supplied at low voltage when working cascade or at high voltage when working direct. In this device each phase has three windings, which are placed in parallel and delta connected when working cascade, and are placed in series and star connected when working direct. The leads are brought out through the case at the top. Corresponding to the three speeds the switch has three positions, and the position taken up depends on which of the three cylinders receives air from a reservoir under pressure which is also used for working all the other regulating appliances and the brakes. It should be noted that in this, and, in fact, in most motors made by Ganz & Co. for main-line working, the slip-rings are fitted outside of the crank so as to utilize the whole of the space between the bearings for the motor itself. In some cases it may be desirable to build locomotives for four standard speeds, and this may be done by using "double cascade." Here the main motor has four poles, and if used alone will give a speed of 50 miles per hour. By combining it with the two cascade motors of two and six poles respectively, a speed of 16.7 miles per hour can be had; by using the main motor with the six-pole cascade motor the speed is 20 miles per hour, and if used with the two-pole cascade motor it is 33.5 miles per hour.

It is interesting to compare the weights of the three types of motors—namely, the continuous-current, the single-phase, and the three-phase. In construction the single-phase resembles the continuous-current motor, the only difference being that its field must be laminated, and that a compensating winding must be added to reduce self-inductance. Since the supply of power is pulsating, the torque for equal weight and magnetization can only be —— of the torque of the continuous-current motor—that is to say, the single-phase motor—especially as its power factor can never be unity, must be 40 to 50 per cent heavier than an equally powerful continuous-current motor. In point of bulk and weight the three-phase motor has a great advantage. For equal armature loading (by which I mean ampere turns per unit length of rotor circumference) the torque is about the same as that of a continuous-current motor. Theoretically it should be 16 per cent greater, but as the power factor (although better than that of a single-phase motor) can never be unity, the advantage of these 16 per cent is lost, but the assumption of equal loading is not correct. In the continuous-current motor, the ampere wires on the armature are only one-half to three-eighths of the field. It is true that by the introduction of commutating poles the disproportion may be somewhat reduced, but the gain is small since, owing to saturation of armature teeth, the distortion of the main field is accompanied by a reduction of useful flux, so that after a certain point is reached the torque does not increase by loading the armature further. In the three-phase motor the load on the rotor is always nearly equal to that on the stator; there is no distortion of the field, and the torque is only limited by the heat capacity of the wires. For this reason three-phase motors are lighter than continuous-current motors of equal power and tractive effort. Their over-all dimensions are less because the slip-rings may be put outside the bearings, whilst in a continuous-current motor the equivalent part—namely, the commutator—must be inside the motor case. Mr. Valatin has introduced the conception of "weight factor," which is a number obtained by dividing the product of speed and weight by the horsepower. Taking, on this basis, the weight factor of a continuous-current motor as 100, the weight factor of a corresponding single-phase motor comes to about 140, and that of a three-phase motor to 60.

Italy.—To the Italian Government belongs the distinction of having from the first realized the enormous advantage electric railway service has for that country. The Milan-Ponto Cerese and, shortly after, the Valtellina lines, were built under Government sanction, and with the intention of being eventually taken over by the Government when the transfer of the steam roads to the State should take place. The experience gained on both these lines has been so favorable that the Italian Government has decided to electrify some other lines at once, and it may be expected that this process will go on steadily, so that eventually all the Italian lines will be worked electrically. For a country which has no coal but plenty of water power, this is obviously a sound policy. There was another circumstance which prompted the Government to set aside a considerable sum (nearly three million pounds) in its last budget for electrification. The whole of the coal used for industrial purposes in Milan and other centers in Lombardy comes by sea via Genoa. The railway lines from Genoa to Milan climb the steep slope of the Apennines north of San Pirredarena, and owing to the heavy gradients only short trains can be dispatched. In addition to the coal traffic there is a large goods traffic for Switzerland and Germany passing over the same metals, so that at times the lines are very congested, and last winter Milan was on the brink of a coal famine. With electric traction the capacity of the existing lines will be nearly trebled, so that the supply of coal to the vast industry of Milan and of Lombardy generally will be assured. On the proposal of the Government the Italian Parliament voted in the last session 1.52 million pounds for power stations, sub-stations, and line equipment, and 1.28 millions for electric locomotives, the intention being to retain the existing passenger and goods rolling-stock and simply change the steam locomotives for electric locomotives. The present program comprises the electrification of 11 main lines, of which two are in Upper Italy, one in Central, and one in Southern Italy. The total mileage is 247, and the total length of track 337 miles. The system throughout is three-phase current, with 3,000 volts on the trolley wires at 15 frequency. The pressure on the feeders is 13,000, 20,000, and 25,000 volts, according to distance, and the sub-station will be fitted with four transformers of 750 kilowatts, of which three connected in delta will supply the line, whilst the fourth is spare. The locomotives will weigh 60 tons, and have five driving axles. They will be fitted with two 1,000-horsepower three-phase motors. The engineers of the Italian Government are evidently strong believers in the three-phase system, which is probably the result of the very satisfactory working of the line which Messrs. Ganz & Co. have electrified in the Valtellina five years ago. This line has a total mileage of 67, and presents a maximum of difficulties. Of the section Lecco-Colico, 33 per cent is tunnel, there are curves of 1,000 feet radius (on switchings and crossings only 500 feet), and there are gradients up to 20 per 1,000. The pressure in the feeders is 20,000 volts, and that in the trolley wires is 3,000 volts. The rails act as one of the conductors. Although the opponents of the three-phase system have prophesied all sorts of trouble with the two overhead conductors, there has been none, and the officials are so satisfied with the system that a proposal is now being considered to change the continuous-current equipment on the Milan-Gallerate-Ponte Caresio line for three-phase equipment. This must not be taken as an adverse criticism on the oldest electric main line in Italy. The line is working very satisfactorily. Since its electrification the number of trains has been quadrupled (the trains being shorter and more frequent), and the number of passengers carried is two and one-half times what it was in steam days. Still, the Italian engineers seem to think that the line could do better still if converted to the three-phase system.

(To be continued.)

Approved Electrical Devices

This department from time to time will contain an illustrated description of all fittings approved by the Underwriters' National Electric Association.

CABLES, ARMORED.

Sterling, flexible armored cable (single wire or multiple conductors). Approved January 20, 1908. Manufactured by

Safety-Armorite Conduit Co., Bailey-Farrell Bldg., Pittsburg, Pa.

CONDUIT BOXES, FLOOR OUTLET.

"Simplex" Floor Boxes, Cat. Nos. 3000, 3000A, 3000B, and adjustable types, Nos. 4000, 4000A and 4000B. Approved Jan. 29, 1908. Manufactured by

Stanley & Patterson, 23 Murray St., New York City.

CONDUIT, UNLINED.

Sterling flexible steel conduit. Approved January 20, 1908. Manufactured by

Safety Armorite Conduit Co., Bailey-Farrell Bldg., Philadelphia, Pa.

FLEXIBLE CORD, PENDANT.

Marking: Brown thread, cabled with copper strand. Approved January 29, 1908. Manufactured by

Standard Underground Cable Co., Pittsburg, Pa.

GROUND CLAMPS.

"D. & D." ground connection clamp. A copper band looped through a ring in special bolt and secured by nut on this bolt. Approved January 29, 1908. Manufactured by

Bernard J. Dever, 1931 Wolf St., Philadelphia, Pa.

SWITCHES, SURFACE SNAP.

Push and Pull Type, 125 volts, single pole, Cat. No. 917, 15A., No. 918, 25A.; double pole, Cat. No. 992, 10A., No. 841, 15A., and 842, 25A. Approved January 29, 1908. Manufactured by

Bryant Electric Co., Bridgeport, Conn.

WIRES, RUBBER COVERED.

Marking: Green and black threads crossing in braid. Approved February 1, 1908. Manufactured by

Atlantic Insulated Wire & Cable Co., 120 Liberty St., New York, and Stamford, Conn.

ATTACHMENT PLUGS, FUSELESS.

"Bryant" 3A., 250V. Edison types. Porcelain, brass cap, Cat. No. 1948; Composition, Cat. No. 345. Approved February 3, 1908. Manufactured by

Bryant Electric Co., Bridgeport, Conn.

CABINETS.

"Wurdack." Built up on formed steel cabinets, with or without slate or asbestos gutters, steel or wood fronts, with or without glass panel in door. Approved January 18, 1908. Manufactured by

Wm. Wurdack Elec. Mfg. Co., 19 S. Eleventh St., St. Louis, Mo.

CONDUIT OUTLET PLATE.

"Fancleve" Cat. Nos. 601-605, inclusive; for knob and tube work. Cat. No. 700 for flexible armored cable. Approved January 15, 1908. Manufactured by

John L. Gleason, 290 South St., Jamaica Plain, Mass.

CUTOUT BASES, PLUG FUSE.

Porcelain base, all types, O-30A., 250V. Approved February 5, 1908. Manufactured by

Empire Electric Mfg. Co., Plainville, Conn.

FIXTURES.

Frink Show Case and Window Reflectors. Metal bodies with corrugated glass or metal reflectors, having main supply wires with slow-burning insulation and fixture wiring, with rubber insulation. Approved February 3, 1908. Manufactured by

O. P. Frink, 551 Pearl St., New York, N. Y.

Morse adjustable fixtures for mounting on benches or side walls. Cat. Nos. 1 to 5 inclusive. Approved January 3, 1908. Manufactured by

Frank W. Morse, 516 Atlantic Ave., Boston, Mass.

FLEXIBLE CORD, PORTABLE, FOR ELECTRIC HEATERS.

Double or triple conductor cords, composed of braided conductors, with rubber and asbestos coverings, the several conductors separately protected by woven cotton braids and inclosed by an outer glazed cotton covering. Approved December 31, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

GROUND CLAMPS.

Perma Effect. A single strip of hard drawn copper, having the ends secured by a single bolt and provided with a lug for soldered connection to ground wire. Sizes for ⅜ to 3 inch piping. Approved February 5, 1908. Manufactured by

Chas. W. Messner, 3704 N. Broad St., Philadelphia, Pa.

LAMP ADJUSTER.

Style I-H "Universal" adjustable ceiling or side-wall fixture: Wooden rods, with Universal joints, clamps and socket holder. Approved when equipped with approved reinforced cord, February 5, 1908. Manufactured by

Gail-Webb Mfg. Co., 2-4 Lock St., Buffalo, N. Y.

LAMP CLUSTERS.

"Benjamin" newer multiple types, Nos. 5 and 5K, having metal ceiling plates, porcelain bodies and outer shells without removable rings. Approved January 18, 1908. Manufactured by

Benjamin Elec. Mfg. Co., 42 W. Jackson Blvd., Chicago, Ill.

MISCELLANEOUS.

"G. E." combination compensator and socket for A. C. low-voltage Tungsten lamps, 25 watts, 125 V. This fitting is intended for insertion in the ordinary lamp socket and delivers a lamp voltage of approximately 20 volts. Approved February 1, 1908. Manufactured by

General Electric Co., Schenectady, N. Y.

RECEPTACLE FOR ATTACHMENT PLUGS.

Surface receptacle, Cat. No. 812, three-way indicating receptacle and plug for use with electric heating devices, 15 A., 250 V. Approved February 5, 1908. Manufactured by

American Electrical Heater Co., Detroit, Mich.

Flush receptacle and plug. Cat. No. 5551, 15A., 250V. Metal-covered plug, with knife-blade contacts. Approved February 5, 1908. Manufactured by

Harvey Hubbell, Inc., 35 Organ St., Bridgeport, Conn.

RECEPTACLES, STANDARD.

"P. & S.," 3A., 250V. (keyless), and 50 C. P., 250 V. (key), wall sockets, brass shell, Cat. Nos. 387, 0387, 455 and 456. Porcelain Shell, Nos. 2371, 02371, 237, 0237, 247, 0247, 1087 and 107. Cleat Receptacles, Nos. 870 and 871. Moulding Receptacles, Nos. 670 and 770. Sign Receptacles, Nos. 973, 977, 777, 1072 and 975. Removable Ring Type, Nos. 577, 578, 877 and 988. Approved February 5, 1908. Manufactured by

Pass & Seymour, Inc., Solway, N. Y.

RHEOSTATS.

Drum controllers of types, voltages and horsepower as described in manufacturer's Bulletins Nos. 66, 66A, 67, 67½, 68, 68½, 69, 72B, 77 and 78. Approved when properly installed in connection with suitable resistance elements, January 18, 1908. Manufactured by

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Form P and P M resistance units, sizes A, B, and C. Asbestos tubes wound with resistance coil and covered with cement. Approved when suitably mounted on bases of noncombustible material, January 17, 1908. Manufactured by

General Electric Co., Schenectady, N. Y.

G. E. motor starting, types S A and S B, with field control type S F A; also type R A speed-regulating rheostats for continuous duty, 125-500V. Approved January 18, 1908. Manufactured by

General Electric Co., Schenectady, N. Y.

SOCKETS, STANDARD.

Right Angle and Twin Sockets, with swiveling screw plug attachment. The Twin Sockets are arranged for two lamps in series, Cat. Nos. 941 and 942½. Approved January 18, 1908. Manufactured by

Benjamin Elec. Mfg. Co., 42 W. Jackson Blvd., Chicago, Ill.

Brass shell, key and keyless, Cat. Nos. 9386, 9392, 50760, and 50768, and "Security Snap" Nos. 44147 to 44152, inclusive, 44814 and 44815, also above types with shade holders attached. Approved February 5, 1908. Manufactured by

Marshall Electric Mfg. Co., 301 Congress St., Boston, Mass.

SWITCHES, SURFACE SNAP.

"Arrow E" switches, having old form of terminal, with set-screw binding posts, and new types with binding screw and upturned lug form of terminal. Approved January 30 and 31, 1908. Manufactured by

Arrow Electric Co., 630 Hartford Ave., Hartford, Conn.

SWITCH BOXES.

"M. & M." pressed steel switch boxes for knob and tube work. Replaceable seals. Approved January 3, 1908. Manufactured by

Macken & Mayer Electrical Mfg. Co., Twelfth and Buttonwood Sts., Philadelphia, Pa.

WIRES, RUBBER COVERED.

Marking: Green and black thread parallel to braid. Approved December 31, 1907. Manufactured by

W. R. Brixey, 203 Broadway, New York City.

WIRE INSPECTION.

The Underwriters' Laboratories, Chicago, announces that after extended conferences with the representatives of manufacturers of rubber-covered wires and cords, and following notices sent all manufacturers utilizing the services of the Wire Inspection Bureau, affiliation with that bureau has been withdrawn, and its reports will not be accepted after Saturday, Feb. 29. Stamps or labels issued by the Wire Inspection Bureau and attached to rubber-covered wires, or cords after Saturday, February 29, should therefore not be recognized as having been affixed under the supervision of the Laboratories, representing insurance interests. The announcement further states that during the progress of negotiations resulting in the action reported above, inspection departments, users and manufacturers have requested the inauguration of a system of testing, inspecting and labeling insulated wires and cords at factories which would receive the endorsement of the Laboratories, and the conduct of such a service, along the lines established by the Laboratories for a number of other industries, is under consideration.

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VOL. XX MARCH 7, 1908 No. 10

EDITORIAL.

TRANSFORMER OIL.

Transformer oil, its proper character, treatment and use, has been much neglected by central station engineers. It forms one of the weak links in the chain of a high-tension electric-transmission system. In its dual function as insulator and cooler, it requires high dielectric strength and high flash point, combined with great fluidity. It should be neutral so as to not dissolve the insulation of the core and coils immersed in it.

Of these qualities, the dielectric strength is the most variable, for it depends largely upon the amount of moisture present. The popular axiom that oil and water do not mix is not scientifically correct, for oil does absorb a small amount of moisture that materially lessens its dielectric strength. We know of an oil that broke down under 16,000 volts when wet, but stood the test of 40,000 volts after being dried. While oil and water do not chemically mix, they may mingle so closely as to require steam or rheostat heating to remove the water. Every precaution should be taken to keep oil dry during shipment and in use, for it abhors dehydration even more than Nature abhors a vacuum.

It should have a high fire or flash test to eliminate danger of fire. Crude oil is refined by fractional distillation, the most volatile products passing off first. These are low in gravity and in burning temperature, as is exemplified by gasoline. Kerosene for use in lamps is one of the next products, soon followed by an oil suitable for transformer purposes. This usually has a gravity of 30 degrees Baume, or less, and burns at about 300 degrees Fahrenheit. The higher the temperature at which the product is distilled, the greater its viscosity. Consequently what is gained in flashing temperature is lost in fluidity. Acid introduced into the refining must be removed by adding just enough alkali to render the oil neutral. Many other valuable products of oil refining have been and are yet to be found, but "they are another story."

These conditions briefly outlined have been met by various companies supplying transformer oils, each loudly proclaiming the merit of its own product. On the Pacific Coast, Eastern "Mineral Seal" was first used. Later, Western "Mineral Seal" was introduced, it having an asphaltum instead of a paraffine base. Subsequently, "Transil No. 6" and many other oils, whose names are legion, have been offered for sale, much as each druggist sells his own brand of hair restorer. Nearly all these are originally bought from the same company, mayhap the same tank, and have been specially treated to impart the desired qualities. The trade name is a distinction without much difference in quality. Disastrous fires, occurring when the oil has been volatilized by an arc, are credited to one and all of them. Another frequent trouble is the deposition of a thick, carbonaceous, jelly-like sludge on the cooling coils and in the circulating ducts. The former are covered so thick that cooling is not effected, and the latter are so clogged that circulation is difficult. Such deterioration generally occurs when the oil has been overheated. The deposit is easily washed off when hot, but becomes hard and brittle upon exposure to the air, resembling bitumen in this respect. The deposits around the points of high potential allow creepage, so that a medium of high resistance may become a conductor.

But careful examinations of these troubles show that they are usually due to no inherent fault of the oil, but to the transformer design, or more particularly to the attendant's carelessness. It reminds us of the story of Paris, who, because he called Venus the most beautiful goddess, gained the loveliest mortal for his wife, but at the same time incurred the enmity of Juno and Minerva, resulting in the ultimate loss of wife and life. The moral is that he should have attended to his own business and devoted himself to whatever wife he might possess, so as to retain her affections and prevent her running off with another man. The same moral is applicable to the central station man with regard to the claims of the various oil partisans as to their special fitness as transformer insulators. Of far more importance than testing their claims is his own undivided attention to the care of whatever oil he may be using. We have instances of transformers that have been in continuous service for twelve years without any change being made in the oil. As a consequence, is it to be wondered that the transformer runs hot? Its design is condemned by the man who has grossly neglected it. He futilely at-

tempts to remove the difficulty by changing to another oil, temporarily solving the question until this oil, too, becomes unfit for service, and the same trouble again occurs. Careful break-down tests should be made not only when the oil is furnished, but at frequent intervals thereafter, once a month not being too often for main stations. Tests for acidity will avoid the destruction of the insulation by dissolving, and flash tests will often prevent fires. The carbon may be removed by occasional filtering. In case of leaky cooling coils, the water should be drawn off from the bottom until such time as the transformer can be taken out of service and properly repaired.

All this trouble occurs with both water and self-cooling transformers. Where water is plentiful, it has been suggested that outside circulation of the oil would cause better cooling, and larger ventilating ducts would not become clogged. We attain success only by the most careful attention to the details of our work. Look after the oil, and transformer troubles will take care of themselves.

TRADE CATALOGUES.

The Murray Iron Works Company, of Burlington, Iowa, send a handsomely printed and bound catalogue, illustrating and describing their line of safety water-tube boilers.

Bulletin No. 1503, entitled, "Allis-Chalmers Direct-Connected Reynolds Corliss Engines," deals with direct-connected units, a comparison with the belt-driven, however, being offered.

In a handsome booklet known as Bulletin No. 4548, the General Electric Company, Schenectady, N. Y., illustrates typical examples of direct and alternating current motors installed on a great variety of lathes, drills, grinders, punchers, shears, boring mills, and similar tools, which are suggestive of their almost limitless adaptability to this character of service. The pamphlet is bound in a light green cover, bearing in reproduction a photograph of the interior of an electrically driven shop.

PERSONAL.

Alfred Collyer has been appointed sales manager for Canada for the Wagner Electric Co., with offices in the Bell Telephone Building, Montreal, Canada.

George A. Campbell, manager of the Reno Power, Light & Water Company, has taken charge as general superintendent of the Truckee River General Electric Company, operating plants at Carson, Virginia, Yerington, Gardnerville, Reno and other points in Nevada.

Mr. Edward B. Smith, of Philadelphia, has been elected a director of the United Railway Investment Company, which controls the United Railroads of San Francisco and the Philadelphia company. Mr. George H. Earle, Jr., of Philadelphia, also is a director of the Company.

Mr. Willard W. Low, president of the Electric Appliance Company of Chicago and of San Francisco has been in San Francisco during the past week renewing his extensive acquaintance with the local electrical trade. He has been particularly with the great work accomplished since the fire, it exceeding all reports.

COPPER MARKET SITUATION.

New business in copper lately has been very slow, and in the absence of any lively demand prices for electrolytic wire bars have receded to 13. A month ago the market was fully a cent per pound higher than at present, but the extreme indifference manifested by all branches of the trade has rendered it quite impossible to hold prices up to the 14 cent level. Specifications for wire and other mill products are far below normal, and the various manufacturing plants have consequently a great deal of idle capacity which cannot be employed for lack of orders.

The amount of idle machinery waiting for conditions to improve would be hard to compute. In different industrial sections of the country milling operations have been scaled down to a point incompatible with the degree of activity these great plants were designed to reach. The capital and equipment which have gone into many of these establishments fit them for producing heavily, and to be compelled to operate on part time on account of limited orders is a serious handicap. The aggravating feature in such conditions is the fact that the present depression in business is rendered more acute if it is not largely attributable to the persistent vociferations and agitation by those high in authority, which is a direct drawback to the peaceable pursuit of business development on a large scale. The recent denunciations have created a feeling of disquietude in business circles, and there are unmistakable signs that it will take confidence a long time to recover from the assaults made upon it.

The copper situation cannot go it alone, and in sympathy with the general state of affairs it has lost the little tone it seemed to have a few weeks ago. Consumption is so restricted as to be absolutely unable to furnish any stimulus to the market, and rumors of increasing production acts as a damper upon any sentiment savoring of bullishness. Exports of copper also show a material falling off from the high figures, and that means more supplies available here where the outlet is already so narrow. It is not surprising, therefore, to find more pressure to sell and with no improvement to report in the domestic demand it is not necessary to search far for an explanation of the declining market. The enormous export of the past four months has placed a big supply of copper in Europe for English, French and German consumers, and we cannot expect foreign demand to cut a very large figure in the market until the American shipments begin to disappear. A strong all-round demand in this country from the wire people and other consumers is what is needed to put life into the copper market.

MARCH MEETING OF THE A. S. M. E.

The March meeting of the American Society of Mechanical Engineers will be held on Tuesday evening, March 10th, at 8:15 o'clock, in the Engineering Societies' Building. The meeting will be addressed by Dr. Charles P. Steinmetz, member A. S. M. E., past president A. I. E. E., and Professor of Electrical Engineering, Union University, the subject being, "The Steam Path of the Steam Turbine."

TRADE NOTES.

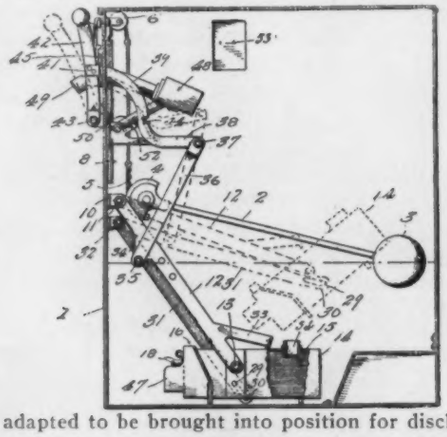
A. C. Thode & Co., of San Francicso, have been awarded the contract for the electrical work to be installed in the El Dorado Brewery, of Stockton, California.

American-made tungsten lamps are gradually appearing on the Pacific Coast. From the Franklin Electric Mfg. Company through the Holabird-Reynolds Electric Company we are in receipt of 40 and 60 watt lamps of 32 and 48 candle power.

PATENTS

SELF-MEASURING TANK. 879,263. John Heissenberger, New York, N. Y., assignor to Automatic Utilities Company, New York, N. Y.

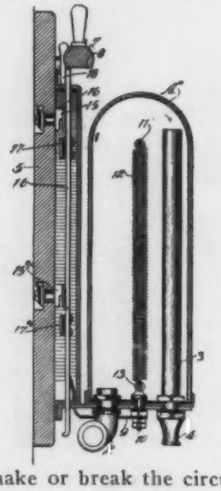
In an automatic or self-measuring tank, the combination with a tank, a swinging measuring receptacle mounted therein, a discharge mechanism normally held out of discharge



position adapted to be brought into position for discharge by engagement with the measuring receptacle, a series of compartments in the measuring receptacle provided each with an outlet, spring controlled valves for outlets, and hand operated levers for acting upon the desired valve to discharge the liquid from the proper compartment of the receptacle.

ELECTRICAL WATER-HEATER. 879,498. Milton H. Shoenberg, San Francisco, Cal.

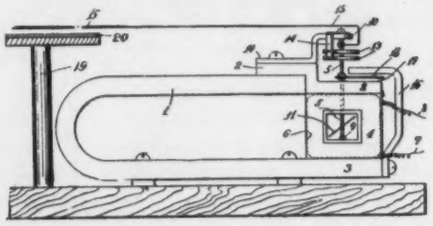
An electrical water-heater consisting of a water-receiver having inlet and discharge passages, a series of naked electrical coils out of contact, extending through the chamber, a standard extending in the direction of the length of the water receiver, contacts with which the opposite ends of the coils are connected, one of contacts being fixedly connected to the standard and extending transverse of the latter a slidable



switch adapted to make or break the circuit by contact with or separation from plates, a lever by which the device is actuated, a water-supply cock having a cylindrical stem extending into the plane of movement of the switch lever, lever operating in a plane substantially parallel with the axis of the stem and stem being cut away on one side to allow the switch lever to move when the water-cock is opened, and to prevent it from moving when said cock is closed.

ELECTRICAL MEASURING INSTRUMENT. 879,385. Adrian H. Hoyt, Penacook, N. H., assignor to Whitney Electrical Instrument Company.

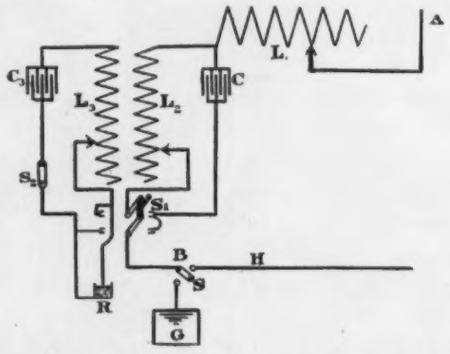
In an electrical measuring instrument, the combination of a magnet, a pivoted shaft, an element mounted upon shaft



in the field of force of the magnet in such manner as not to be moved thereby, a coil carrying current adapted to rotate element, springs opposing the movement of the element, and a mass of dampening material carried by shaft and moving in a magnetic field.

WIRELESS TELEGRAPHY. 879,409. George W. Pierce, Cambridge, Mass., assignor to Massachusetts Wireless Equipment Company.

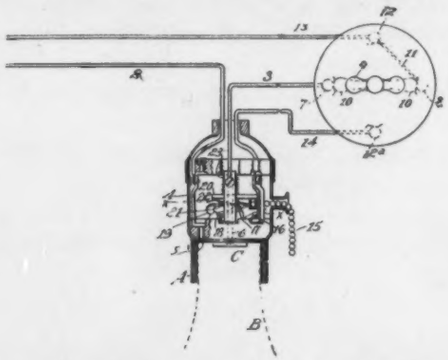
In a receiving system for wireless telegraphy, an induc-



tive connection having a variable secondary, a detector and a condenser connected with the secondary, and connections for sending the currents set up in the primary of the inductive connection through the detector or directly to the ground.

INCANDESCENT-LAMP CONTROL. 879,555. Roy E. Kimball, Fruitvale, Cal.

In an apparatus of the character described, a lamp socket with a plurality of electrical circuits, fixed conducting plates with independent connections through circuits, a post having



connection with the main circuit, a ratchet disk having electrical connection with the post, and carrying arms adapted to make successive contact with the conducting plates, an insulating disk and pawls carried thereby, and means to engage the pawls and advance the ratchet disk.

INDUSTRIAL

KIERULFF AGENCIES.

B. F. Kierulff, Jr. & Co., who have for a number of years had their principal place of business in Los Angeles, as dealers in electrical and telephone equipment and sales agents for a number of large Eastern firms, have opened an office and warehouse at 824 Folsom Street, in charge of Mr. F. E. Stewart, who will look after their lines in the Northern California territory. During the past year they have closed up a number of large contracts in the southern part of the State, among others being one with the United States Government for a large quantity of steel poles for the United States Reclamation Service, and another for steel poles for the Municipal Lighting Plant at Pasadena, California. They are pushing the weatherproof wire products of the Chicago Insulated Wire & Manufacturing Co., of Chicago, and, in addition to securing a large part of the weatherproof wire trade in Southern California, recently closed a large contract with the City Electric Company, of San Francisco.

TRIPARTITE STEEL POLES FOR PASADENA MUNICIPAL LIGHT PLANT, SHOWING A COMPARISON FROM THE ARTISTIC STANDPOINT.

Among the other lines which they will represent is the fireproof asbestos magnet wire manufactured by the Heany Fire Proof Wire Co. This wire has been exclusively adopted by all the electric roads of Southern California for winding their armature and field coils.

Their agencies include the following lines: Chicago Insulated Wire & Manufacturing Co., Chicago, Ill., weatherproof wires and cables; Waclark Wire Co., New York, N. Y., bare copper wires and cables; Heany Fire Proof Wire Co., York, Pa., fireproof magnet wire; National India Rubber Co., Bristol, R. I., rubber-covered wires; Hartman Circuit Breaker Co., Mansfield, Ohio, oil switches; Dielectric Manufacturing Co., St. Louis, Mo., insulating tapes and varnishes; Lord Electric Co., New York, N. Y., Thomas rail bonds, Shaw lightning arresters and Earll trolley retrievers; Sterling Electric Co., La Fayette, Ind., telephones, switchboards and protectors; Bristol Co., Waterbury, Conn., recording instruments; Franklin Rolling Mill & Foundry Co., Franklin, Pa., tripartite steel poles.

This company is also now in a position to take the installation of complete electric power plants, and in this capacity has just finished the installation of a power plant for the Holton Power Company at El Centro, Imperial Valley. They are also representing the American Diesel Engine Company, manufacturing the famous Diesel oil engines.

WESTINGHOUSE ELECTRICALLY-HEATED GLUE POTS.

The Westinghouse Electric & Manufacturing Company is putting on the market a line of improved electrically-heated glue pots that represent the application of electricity in the simplest and most convenient form. The pots are made in two-quart and four-quart sizes, in both portable and bench types. They are made of the best materials for the purpose, and the application of electricity is as simple as it is efficient. There is nothing to get out of order or to require any more

attention than is given the ordinary glue pot.

They are especially desirable for use in those crafts where cleanliness is an important factor, where drip from steam pipes means damage to valuable materials, and where the fire risk from a gas-heated glue pot is hazardous. At the same time their convenience and reliability recommend them to all users of glue.

The pots themselves are of seamless drawn copper with brass bail and wiper rod. The water bath is made of seamless copper, and the heating element, which is wrapped around the lower portion, is enclosed in a water-tight tin envelope. The water bath is provided with a patent circulating device, which gives it the maximum heating efficiency. This device consists of a hollow ring, the lower end of which is closed by a diaphragm having a central opening. This confines the heating action to the thin film of water outside of the device, and sets up a rapid circulation in the water, which brings the glue up to the working temperature in a short time.

To further promote economical heating, the pots are provided with heat regulating switches, by means of which the glue can rapidly be brought to the desired temperature, and then maintained there by a lower temperature of current. The accompanying picture shows the parts of the four-quart portable pot, including the water circulating device. Electrically-heated dry glue pots are made for those industries where the water bath glue pot is undesirable.

THE DURABILITY OF MODERN ELECTRICAL APPARATUS.

Electrical apparatus, when constructed in accordance with the best engineering practice, is well nigh indestructible if subjected only to the ordinary amount of wear and tear, and often comes out with flying colors from the devastating reign of floods and fires. The few incidents quoted below are excellent examples of the amount of hard usage that well constructed electrical apparatus will survive, and still be in working condition.

In the Knights Deep Mine near Johannesburg, South Africa, there were installed thirty-six 15-kilowatt transformers, and twelve three-phase, 50-horsepower General Electric induction motors for operating the mine pumps. Through a peculiar combination of circumstances, the mine was allowed to fill with water, the motors and transformers remaining under several hundred feet of water for over two years.

When taken out, three of the motors were rewound in the local repair shop. The others were simply dried out and then soaked in oil. Contrary to all expectations and to the surprise of all concerned, the insulation was found to be in excellent condition, and the motors were put into service, apparently none the worse for their high pressure bath. The transformers were treated in the same manner, and shortly afterward they replaced several transformers of English make, which had burned out only a short time after being installed.

A railway power station situated near the Mississippi River experienced a severe flood during the season of high water. Two 1,500-kilowatt, 6,000-volt generators were more than half under water for nearly a week, but when dried out carried their load without giving any trouble whatever. In fact, the first machine to be dried out, carried the entire railway load until the second machine could be put into condition.

A three-horsepower induction motor was taken from the ruins of the printing office of "The Democrat," Ellsworth, Maine, some few days after the entire building had been destroyed by fire. After being freed from the protecting coat of ice and cinders, the motor was dried and cleaned. When connected to the circuit is ran as smoothly as when first installed. Some idea of the intensity of the heat to which the motor was subjected may be gained from the fact that the switchboard and instruments were completely destroyed.

A General Electric 20-horsepower, 550-volt, 3-phase induction motor, installed in a leather warehouse in Salem, Mass., was subjected to a severe ordeal during a fire. After the building and its contents had been deluged with water, the motor was removed, and after being cleaned, dried and fitted with another pulley, started immediately on application of the current. The motor has since carried its rated load, and does not appear to be damaged in any way except as to appearance.

Another excellent example of the durability of the induction motor was shown by the remarkable performance of a General Electric 5-horsepower motor, which was used in driving a pump in the G. H. Perry Co.'s quarry in South Dakota. The motor was often allowed to run without any attention over night, especially during the rainy season. One night a heavy rainstorm filled the quarry to such a height that the motor was half under water. When started the next morning, it picked up its load and carried it steadily until the pit was emptied of water. On examination it was found to be none the worse for its prolonged bath, although a new pulley had to be put on in place of the old one, which was softened and warped out of shape.

Several hundred General Electric flat irons passed through the San Francisco fire, and aside from the fact that the wooden handle was destroyed and the iron slightly disfigured, the iron was as good as ever.

An opinion was filed in the United States Circuit Court of Appeals for the District of New Jersey, sustaining an opinion rendered some time ago in favor of the Westinghouse Electric & Mfg. Company against the Prudential Insurance Company, of Newark, N. J.

This suit, brought by the Westinghouse Electric & Mfg. Company against the Prudential Insurance Company, of Newark, N. J., to restrain it from further infringement of Nolan patent No. 582,481, in the use of a direct-current generator manufactured by the Bullock Electric Mfg. Company, was decided in favor of the Westinghouse Company in the U. S. Circuit Court, District of New Jersey, and now the Court of Appeals sustains the opinion of the lower court, holding that claims 2 and 4 of the patent are valid and infringed by the use of the Bullock generator in question.

The feature of the direct-current generator to which this patent relates, is the means used for clamping the armature laminae in place, and the particular feature is the means for holding the movable clamping ring or flange in position, a split ring partially located in a circumferential groove in the armature spider being used to hold the clamping plate in position, the ring itself being held from centrifugal movement by a shoulder upon the clamping plate. This is an important feature of construction, as it obviates the use of bolts passing through the laminae for the purpose of holding them together.

The business of the Westinghouse Machine Company during the month of February has continued to show the most encouraging signs of improvement. Quite a number of excellent orders have been received in the various departments. There is as a result much greater activity in the shops at East Pittsburg. Unusually large shipments have been sent from the works on export delivery, including several large steam engines. One of these shipments, consisting of five 125-horsepower compound engines, was consigned to Takata & Company, the Japanese agents of the Westinghouse Companies in Tokio, for delivery to a manufacturing plant in Canton, China. Another compound engine of 500-horsepower capacity also included in this shipment was consigned to the same firm for delivery to the Southern Japanese Railway Company, of Kaisha, Japan

The receivers of the company are reporting very encouraging progress with the plan of rehabilitating the company, and it is now expected that its affairs will again be in the control of the stockholders within a very few days.

An interesting incident showing new advantages of motor drives turned up recently. A large Ohio paper mill ordered several engine-type generators of the Northern Electrical Manufacturing Company, Madison, Wis. Through an oversight, the customer did not specify who should mount the armature on the engine shaft, and thus neither the engine builder nor dynamo manufacturer made provisions for mounting the armature. When this was discovered, after erecting operations had begun, it was found that no jobbing shop was in a position to handle a force fit of about 150 tons. Accordingly, the Northern Electrical Manufacturing Company shipped from its works one of its motor-driven hydraulic presses, with necessary rigging for pressing the armature on the shaft. A small generator was rigged up to furnish current, and the job of pressing completed in short order. Had not the portable motor-driven outfit been available, considerable delay would have been necessary, and much expense to ship the armature and shafts to the engine builder's factory for mounting.

NEWS NOTES

TRANSPORTATION.

Visalia, Cal.—F. S. Granger is planning to build an electric road from Tulare to Porterville.

San Diego, Cal.—E. W. Peterson has made application for a street car franchise at South San Diego. The franchise applied for will connect the first franchise, obtained last month, with Imperial Beach, a new tract.

Los Angeles, Cal.—Promoters of the scenic railway along the rim of the Grand Canyon of the Colorado, in Arizona, are in Los Angeles perfecting plans for the railway. Should the road be built gasoline motors will probably be used.

San Francisco, Cal.—The Board of Health has submitted to the Board of Supervisors the draft of an ordinance designed to prevent smoking in street cars. The proposed measure makes it a misdemeanor for any one to smoke a pipe, cigar or cigarette in any street car, no recognition being given to a "smoking apartment" therein, such as now exists in the newer cars in use.

San Francisco, Cal.—In a suit brought by the Pacific Electric Railroad Company to compel A. Campbell-Johnson, C. S. Campbell-Johnson and the San Rafael Ranch Company to perform a contract entered into to turn over to the railroad company rights of way and franchises between Los Angeles and Pasadena, the Supreme Court affirmed the judgment of the lower court denying the petition of the railroad company.

San Bernardino, Cal.—A contract was signed this week under the terms of which the Pacific Light & Power Company supplies the San Bernardino Valley Traction Company with the necessary electrical power to operate its system. Since the traction company has been in business here the power has been furnished by the Edison Electric Company, of Los Angeles. The Pacific Light & Power Company will bring its power for the traction system from its plants in the Santa Ana Canyon.

OIL.

Coalinga, Cal.—The general land office is investigating claim jumping in the Coalinga oil fields. It is disclosed that many persons have filed homestead entries on land where mineral locations have been made, and where labor has been performed with the evident intention of developing for oil purposes. It is charged that a majority of these second filings have been made for the purpose of securing claims of 160 acres each from the oil men who are entitled to them.

Salt Lake City, Utah.—An oil refinery to cost not less than $200,000, will be built in the Uintah field by the Tonopah and California interest now ready to start drilling there, in the event that the new wells to be sunk are able to match the results already obtained by the Tunnel Oil Company, which has a small refinery on the ground. This is the report of John T. Pope, president and manager of the Tunnel Oil Company, and a director of the Uintah Pioneer Oil Company.

San Diego, Cal.—Announcement is made that the Union Oil Company is shortly to enter the San Diego field as a competitor of the Standard Oil Company, which for years has occupied this part of the State without competition. B. W. McKenzie, president of the Western Metal Supply Company, San Diego agent of the Union Oil Company, states that a site for the erection of a large plant has been secured. This site consists of several acres at the foot of Tenth Street, immediately adjoining the tracks of the new San Diego and Arizona Railroad. Six tanks are to be erected at the start, and a number of other improvements are to be made without delay. Refined oil products of all kinds are to be handled in San Diego by the Union Oil Company, which has heretofore contented itself with the shipment and marketing of crude oil only.

ILLUMINATION.

San Diego, Cal.—A resolution has been adopted by the Council ordering work commenced for placing ornamental lights along Sixth Street between G and E Streets.

Needles.—A party of Los Angeles men have entered into a contract with the Victor Gold Mining Company, and will take from the company electric light power sufficient to light and supply power to Needles. They have commenced the erection of transmission lines throughout the city, and are now furnishing light to some buildings.

San Bernardino, Cal.—It is planned by San Bernardino and Redland capitalists to establish a gas plant at Colton, to supply gas to the Home Gas Companies at Redlands, San Bernardino, Colton, and to a new system to be built in Riverside. The principal backers of the plan are J. Benjamin, of San Bernardino, and C. S. Chesnut, of Redlands.

San Francisco, Cal.—General Manager Black, of the United Railroads, has informed the artificial lights committee of the Supervisors that the company would enter into a contract within a few days for the ornamental poles to be erected in Market and Valencia Streets. He expects to have them in position before the arrival of the fleet. The expense of lighting will be borne by the city. Representatives of various improvement clubs presented designs of poles they contemplated using in the down town streets. The committee instructed them to hold a conference and unite on a design, as the Board would not agree to the erection of poles of different designs.

TRANSPORTATION.

Richmond, Cal.—The bid of John Nicholl for a street railway franchise has been accepted by the Trustees.

Los Angeles, Cal.—All lines of the Los Angeles Pacific are being made broad gauge. Subways will be constructed between this city and Venice, and the Hill Street tunnel will be completed.

Chihuahua, Mexico.—The directors of the new local electric street railway company, A. C. Nash, manager, gave orders this week to commence work on construction of the lines within the city.

San Francisco, Cal.—The street-car strike committee of the Building Trades Council and Labor Council met for the last time this week and disbanded. Of the $400,000 contributed to the fund by the labor unions of the city, State and country, $1400 remains.

Reno, Nev.—At the last City Council meeting the resolution granting a franchise to S. H. Wheeler and Charles Burke, both of this city, to construct an electric railroad over the various streets of Reno from the Southern Pacific depot into the southeastern portion of the city, was passed.

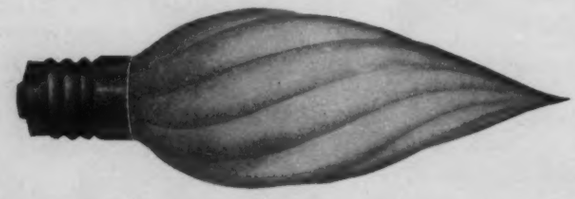
Los Angeles, Cal.—Bids for the sale of the San Pedro South Park Street trolley franchise will be received on March 23rd. The City Council voted to allow the Los Angeles Railway Company its claimed portion of the thoroughfare on San Pedro Street, but will advertise the remainder of the street south of Thirtieth.

Los Angeles, Cal.—J. B. Brockaw and other Hollywood capitalists are planning an electric line up the west slope of Mt. Hollywood and the erection of a pavilion on the top. The incline will be 2500 feet. The route has been inspected by Councilmen, and President Niles Pease of the Council states that the franchise will probably be advertised.

Riverside, Cal.—Because of a question as to the validity of the franchise heretofore granted to A. C. Denman, Jr., the San Bernardino Interurban Railway Company asked the advertisement of the franchise for a line along First Street from Colton Avenue to the Main Street line. The measure was passed to a second reading. Bids will be received until March 24th.

Oakland, Cal.—The railroad committee of the Oakland City Council has recommended for passage a franchise which will enable the Oakland Traction Company to operate a line of cars along East Sixteenth Street from First Avenue to Twenty-second. A ten-minute service will be given. The line is in the nature of a compromise between the residents of East Oakland and the traction company.

All Kinds of Lamps



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